

WHAT IS CLAIMED IS:

1. An isolated bacterial strain that oxidizes ammonia to nitrite, comprising a nucleotide sequence selected from the group consisting of: a nucleotide sequence that has greater than 98% identity over the full length thereof to SEQ ID NO:3, a nucleotide sequence that has greater than 98% identity over the full length thereof to SEQ ID NO:4, a nucleotide sequence that has at least 96% identity over the full length thereof to SEQ ID NO:1 and a nucleotide sequence that has at least 96% identity over the full length thereof to SEQ ID NO:2.
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2. The bacterial strain of claim 1 wherein the nucleotide sequence is identical to a sequence selected from the group consisting of SEQ ID NO:1, SEQ ID NO:2, SEQ ID NO:3 and SEQ ID NO:4.
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3. A biologically pure culture of a bacterial strain that oxidizes ammonia to nitrite, wherein the 16S rDNA of the bacterial strain has a nucleotide sequence selected from the group consisting of: a nucleotide sequence that has greater than 98% identity over the full length thereof to SEQ ID NO:3, a nucleotide sequence that has greater than 98% identity over the full length thereof to SEQ ID NO:4, a nucleotide sequence that has at least 96% identity over the full length thereof to SEQ ID NO:1 and a nucleotide sequence that has at least 96% identity over the full length thereof to SEQ ID NO:2.
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4. The biologically pure culture of claim 3 wherein the nucleotide sequence is identical to a sequence selected from the group consisting of SEQ ID NO:1, SEQ ID NO:2, SEQ ID NO:3 and SEQ ID NO:4.
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5. A composition comprising an isolated bacterial strain that oxidizes ammonia to nitrite, wherein said bacterial strain comprises a nucleotide sequence set forth in a sequence selected from the group consisting of SEQ ID NO:1, SEQ ID NO:2, SEQ ID NO:3 and SEQ ID NO:4.
6. The composition of claim 5 wherein the composition is in a form selected from the group consisting of liquid, frozen, freeze-dried and powdered.
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7. The composition of claim 5, wherein the composition is included in a polymer.

9. The composition of claim 7, wherein the polymer is selected from the group consisting of acrylamide, alginate, carrageenan, and combinations thereof.

10. A composition comprising an isolated bacterial strain that oxidizes ammonia to nitrite, wherein said bacterial strain comprises a nucleotide sequence set forth in a sequence selected 5 from the group consisting of SEQ ID NO:18, SEQ ID NO:19 and SEQ ID NO:20.

11. The composition of claim 10 wherein the composition is in a form selected from the group consisting of liquid, frozen, freeze-dried and powdered.

12. The composition of claim 10, wherein the composition is included in a polymer.

13. The composition of claim 12, wherein the polymer is selected from the group consisting 10 of acrylamide, alginate, carrageenan, and combinations thereof.

14. A composition comprising a concentrated bacterial strain that oxidizes ammonia to nitrite, wherein the 16S rDNA of the bacterial strain has a nucleotide sequence selected from the group consisting of: a nucleotide sequence that has greater than 98% identity over the full length thereof to SEQ ID NO:3, a nucleotide sequence that has greater than 98% identity over the full length thereof to SEQ ID NO:4, a nucleotide sequence that has at least 96% identity over the full length thereof to SEQ ID NO:1 and a nucleotide sequence that has at least 96% identity over the full length thereof to SEQ ID NO:2.

15. The composition of claim 14 wherein said bacterial strain has a 16S rDNA sequence which is identical to a sequence selected from the group consisting of SEQ ID NO:1, SEQ ID 20 NO:2, SEQ ID NO:3 and SEQ ID NO:4.

16. The composition of claim 14, further comprising a microorganism selected from the group consisting of ammonia-oxidizing microorganisms, nitrite-oxidizing microorganisms, nitrate-reducing microorganisms, heterotrophic microorganisms, and combinations thereof.

17. A composition comprising a concentrated bacterial strain that oxidizes ammonia to nitrite, wherein the 16S rDNA of the bacterial strain has a nucleotide sequence selected from the group consisting of: a nucleotide sequence that has at least 96% identity over the full length thereof to SEQ ID NO:18, a nucleotide sequence that has at least 96% identity over the full 25

length thereof to SEQ ID NO:19 and a nucleotide sequence that has at least 96% identity over the full length thereof to SEQ ID NO:20.

18. The composition of claim 17 wherein said bacterial strain has a 16S rDNA sequence which is identical to a sequence selected from the group consisting of SEQ ID NO:18, SEQ ID 5 NO:19 and SEQ ID NO:20.

19. The composition of claim 17, further comprising a microorganism selected from the group consisting of ammonia-oxidizing microorganisms, nitrite-oxidizing microorganisms, nitrate-reducing microorganisms, heterotrophic microorganisms, and combinations thereof.

20. An isolated nucleic acid comprising a sequence selected from the group consisting of: a 10 nucleotide sequence that has greater than 98% identity over the full length thereof to SEQ ID NO:3, a nucleotide sequence that has greater than 98% identity over the full length thereof to SEQ ID NO:4, a nucleotide sequence that has at least 96% identity over the full length thereof to SEQ ID NO:1 and a nucleotide sequence that has at least 96% identity over the full length thereof to SEQ ID NO:2.

15 21. The isolated nucleic acid of claim 20 wherein said sequence is identical to a sequence selected from the group consisting of SEQ ID NO:1, SEQ ID NO:2, SEQ ID NO:3 and SEQ ID NO:4.

22. An isolated nucleic acid selected from the group consisting of: a nucleotide sequence that 20 has at least 96% identity over the full length thereof to SEQ ID NO:18, a nucleotide sequence that has at least 96% identity over the full length thereof to SEQ ID NO:19 and a nucleotide sequence that has at least 96% identity over the full length thereof to SEQ ID NO:20.

23. The isolated nucleic acid of claim 22 wherein said sequence is identical to a sequence selected from the group consisting of SEQ ID NO:18, SEQ ID NO:19 and SEQ ID NO:20.

24. An oligonucleotide probe comprising a nucleotide sequence selected from the group 25 consisting of SEQ ID NO:5 and SEQ ID NO:8.

25. An oligonucleotide probe that has at least 96% identity over the full length thereof to a nucleotide sequence selected from the group consisting of SEQ ID NO:5 and SEQ ID NO:8,

wherein the oligonucleotide probe hybridizes to the nucleic acid of bacteria having 16S rDNA that has a nucleotide sequence selected from the group consisting of: a nucleotide sequence that has greater than 98% identity over the full length thereof to SEQ ID NO:3, a nucleotide sequence that has greater than 98% identity over the full length thereof to SEQ ID NO:4, a nucleotide sequence that has at least 96% identity over the full length thereof to SEQ ID NO:1 and a nucleotide sequence that has at least 96% identity over the full length thereof to SEQ ID NO:2.

26. An oligonucleotide probe comprising the nucleotide sequence set forth in SEQ ID NO:21.

27. An oligonucleotide probe that has at least 96% identity over the full length thereof to the nucleotide sequence set forth in SEQ ID NO:21, wherein the oligonucleotide probe hybridizes to the nucleic acid of bacteria having 16S rDNA that have a nucleotide sequence that has at least 96% identity over the full length thereof to a sequence selected from the group consisting of SEQ ID NO:18, SEQ ID NO:19 and SEQ ID NO:20.

28. A polymerase chain reaction (PCR) primer selected from the group consisting of SEQ ID NO:6, SEQ ID NO:7, SEQ ID NO:9, SEQ ID NO:10, SEQ ID NO:11, SEQ ID NO:12, SEQ ID NO:13, SEQ ID NO:14, SEQ ID NO:15, SEQ ID NO:16 and SEQ ID NO:17.

29. A polymerase chain reaction (PCR) primer that has at least 96% identity over the full length thereof to a nucleotide sequence selected from the group consisting of SEQ ID NO:6, SEQ ID NO:7, SEQ ID NO:9, SEQ ID NO:10, SEQ ID NO:11, SEQ ID NO:12, SEQ ID NO:13, SEQ ID NO:14, SEQ ID NO:15, SEQ ID NO:16 and SEQ ID NO:17, wherein the PCR primer hybridizes to the nucleic acid of bacteria having 16S rDNA that has a nucleotide sequence selected from the group consisting of: a nucleotide sequence that has greater than 98% identity over the full length thereof to SEQ ID NO:3, a nucleotide sequence that has greater than 98% identity over the full length thereof to SEQ ID NO:4, a nucleotide sequence that has at least 96% identity over the full length thereof to SEQ ID NO:1 and a nucleotide sequence that has at least 96% identity over the full length thereof to SEQ ID NO:2.

30. A polymerase chain reaction (PCR) primer selected from the group consisting of SEQ ID NO:22 and SEQ ID NO:23.

31. A polymerase chain reaction (PCR) primer that has at least 96% identity over the full length thereof to a nucleotide sequence selected from the group consisting of SEQ ID NO:22 and SEQ ID NO:23, wherein the PCR primer hybridizes to the nucleic acid of bacteria having 16S rDNA that have a nucleotide sequence that has at least 96% identity over the full length thereof
5 to a sequence selected from the group consisting of SEQ ID NO:18, SEQ ID NO:19 and SEQ ID NO:20.

32. A composition comprising at least two bacterial strains that oxidize ammonia to nitrite, wherein each of the at least two bacterial strains have 16S rDNA including a nucleotide sequence independently selected from the group consisting of: a nucleotide sequence that has greater than
10 98% identity over the full length thereof to SEQ ID NO:3, a nucleotide sequence that has greater than 98% identity over the full length thereof to SEQ ID NO:4, a nucleotide sequence that has at least 96% identity over the full length thereof to SEQ ID NO:1, a nucleotide sequence that has at least 96% identity over the full length thereof to SEQ ID NO:2, a nucleotide sequence that has at least 96% identity over the full length thereof to SEQ ID NO:18, a nucleotide sequence that has at
15 least 96% identity over the full length thereof to SEQ ID NO:19 and a nucleotide sequence that has at least 96% identity over the full length thereof to SEQ ID NO:20.

33. The composition of claim 30, said composition comprising a bacterial strain with a 16S rDNA including a nucleotide sequence as set forth in SEQ ID NO:1, a bacterial strain with a 16S rDNA including a nucleotide sequence as set forth in SEQ ID NO:2, a bacterial strain with a 16S
20 rDNA including a nucleotide sequence as set forth in SEQ ID NO:3, a bacterial strain with a 16S rDNA including a nucleotide sequence as set forth in SEQ ID NO:4, a bacterial strain with a 16S rDNA including a nucleotide sequence as set forth in SEQ ID NO:18, a bacterial strain with a 16S rDNA including a nucleotide sequence as set forth in SEQ ID NO:19 and a bacterial strain with a 16S rDNA including a nucleotide sequence as set forth in SEQ ID NO:20.